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## RAILWAY POLICE,—COLLISIONS.

The severe accidents which have occurred within a short time upon one of our important railroads, and all being the result of the same cause—collision, the public anxiety has been aroused, and inquiry is made as to what means are provided for the safe passage of trains. There is certainly no more important branch of railway management than that which concerns the safety of hundreds and thousands of human beings.

The laxity of discipline observed upon some railroads, has undoubtedly led to the erroneous impression that suitable checks and precautions are maintained by none; and the ordinary language of the press upon such occasions, has done much to misdirect the public fears after every accident.

We have some recollection of having seen the rules and regulations for the mutual conduct of trains upon the Western railroad, where these accidents have most frequently occurred, but there must be either some fault in the regulations or in the mode of enforcing them. We are, for our own part, certain that such accidents are not necessarily attendant upon the railroad system, and that with proper care and precaution, most, if not all that have happened, might have been avoided.

In all rules intended to regulate railroad trains, we must bear in mind that the enginemen are generally from a class giving far greater credit to mere physical force and courage, than to coolness and skill. Hence it follows that without the proper restraints, such men are much more likely to display fool-hardiness than real courage or judgment. Yet, is it not too often the case, that life and

property is risked where judgment and coolness are constantly required?

Another circumstance to be taken into consideration, is the fact that no conductor of motive power, in any shape or form, is more liable to excitement from his situation, than the engineman, unless indeed, we except the horseman. The clearness of the view, the advanced position, the more perfect control than can be found in any other mode of travel, will tend to excite the engineman to drive his fiery steed faster than he ought under any circumstances, and particularly when under uncertainty as to obstructions and delays. If it is found absolutely necessary to place the engineman of a steamboat under the control of some regularly determined officer, how much more is it necessary to do so with the driver of a locomotive.

It will, then, be found safe not to commit any more power or responsibility to this party than is absolutely necessary. In the management of burden trains the same remarks will apply, and the same necessity for a conductor exists.

The next principle in this department of railway police, is, that all regulations should be definite and specific in their application to each officer or servant of the concern. To accomplish this end, it is evident that none but printed regulations should be in force. The literal adherence to the rules, which is far more condusive to uniformity and concert of action than any implied or general regulations, can by this means be strictly enforced and readily attained. Another benefit to be derived from properly authorized and printed instructions, is the ease with which any departure from them may be noted and reported to the proper officer, either by the persons in the employ of the company or by strangers and passengers.

Nearly every accident by collision has occurred on curves of short radius, and where the view is intercepted by a bank or trees on the concave side. On a straight line nothing of the kind can happen unless in a dense fog. It is therefore essential that regulations on this point should be very precise and leave no room for mistake. On short curves the velocity of the train should always be moderated, as the wear and tare both of the machinery and the road is lessened by such precaution, and the danger of running over cattle or any obstruction wilfully placed, is much lessened. But if there is the remotest chance of meeting a train, too much care cannot be taken and the speed of the train should be reduced to the pace of a man's walk. It may be objected that this would involve a constant and regular delay in the trip. This is admitted, and moreover such delay should be added to the length of time con-

sumed upon the road and counted upon with as much regularity as the usual stoppages—by doing this no disappointment will result, and the trifling loss of time will be more than compensated by the increased security of the passengers and the saving of expense resulting from a single accident. At such points the constant ringing of the bell or blowing of the whistle would be an additional precaution, which should in no case be neglected.

In case of thick fogs intercepting the view, the speed of the engine should in all cases be abated and the bell or whistle continually sounded.

We have not alluded to night trains as they are not frequently used on the majority of roads in our country—but when they are, the proper precautions are obvious. Suitable arrangements of colored lamps will in ordinary cases indicate the approach of a train at as great a distance as they can be detected by the eye in the day time. The sound of the bell or whistle at short and regular intervals will also be required, and in all cases, hardly excepting the brightest moonlight, the speed of a night train should be less than that of the ordinary day trains. Even where no meeting of trains is expected these precautions should not be abated, for although the *number* of persons likely to be crossing the track is less, the *risk* is far greater—while in the stillness of the night the bell or whistle can be heard at a sufficient distance to prevent any danger. We cannot reprehend in too severe terms, the practice of running at night through a populous village, without any other warning than the ordinary sounds of a train, which are almost entirely lost when any object of size intervenes. We have nevertheless seen this frequently done, and if a regularly published system of rules had been in force, the deviation in a single instance would have been reported to the proper authorities, and the abuse immediately corrected.

The consideration of this subject involves that of railway signals, but this is such a fruitful topic that we prefer leaving it for another article, in which the most perfect of all signals, the electro telegraph will be discussed.

We cannot do better in conclusion, than by giving the following rules and regulations adopted on the Baltimore and Susquehanna railroad. The excellence of these rules is proved by the safety of travel on this road, not a single case of collision having happened that we recollect. Yet the curves on this road are frequently, from the nature of the ground, very abrupt, and the view in some places extends but a few yards. From our own observation we can speak of the praiseworthy caution with which these curves are traversed.

Were we disposed to criticise that which is already so complete, we might suggest, that the rule above mentioned of sounding the bell or whistle in all doubtful cases should be introduced:—

"*Baltimore and Susquehanna Railroad Transportation Office,*
"*Baltimore,* 18 .

"The following regulations are prescribed, and will be required to be strictly observed. Every conductor and engineman in the employ of the company is expected to make himself familiar with them. A literal adherence to these instructions being the only security against risk of accidents, they are on no account whatever, to be violated; and no person will be retained in the employ of the company, who in any instance disregards them.

"1. Every train of passenger cars will, after starting, be under the direction of its conductor, who will prescribe the speed of the engine, the places for stopping, and length of time for remaining at the same. A burden train will be under the direction of its engineman, who shall, however, follow the instructions of his conductor, as to the receipt and delivery of freight on the road.

"2. Each conductor, both of passenger and burden trains, shall on every trip note the time of arrival at the different stations and the delay at each, and return the same at this office on his arrival. The speed of all trains on the road must be as nearly as may be, at uniform rates according to the tables given herewith.

"3. A passenger train will wait for the arrival of another passenger train, 30 minutes after the time given in the tables for their leaving the place at which passenger trains are to meet. If one of the trains does not arrive, the other after wating that length of time, will proceed slowly to meet it, going with particular caution round every curve, and at such rate only, as will allow the train to be stopped immediately, without any shock to the cars, on meeting the other.

"4. The conductor of a passenger train which has been delayed so that it has not reached the place for meeting another passenger train, at 25 minutes after the time prescribed for leaving such place, will check the speed of his engine, and proceed in the mode prescribed in the preceding regulation, expecting constantly to meet the other train on the track.

"5. The burden trains will be started in time to reach the stations where they are to meet the passenger trains, some time before the arrival of the latter. A passenger train therefore, not meeting a burden train at the appointed place, will wait but 15

minutes after the time prescribed for leaving such place. It will then proceed in the same careful manner as is directed above in the 3d regulation, prepared to meet the burden train at any moment. The engineman of the burden train which may have been delayed, will, 10 minutes after the time for the passenger train to leave the place of meeting, check his speed, and proceed very slowly in the same manner.

"6 If a passenger train has not arrived at the place for meeting or overtaking a burden train, at 45 minutes after the time for leaving the same, the engineman of the burden train will detach his engine, and leaving his train proceed until he meets the passenger train, to ascertain the cause of delay. He will proceed in the same cautious manner as is prescribed in the 3d regulation. The conductor of the passenger train delayed, will 40 minutes after the time for leaving the place for meeting or overtaking a burden train, also proceed in the same manner, expecting to meet the engine.

"7. A burden train will wait at the place where it is to meet another burden train, one hour beyond the time apointed, if the latter be so long delayed, and will then proceed. The enginemen of both burden trains will in such event proceed in the mode directed in regulations 3d and 4th with extreme caution, especially on descending grades, and keeping their trains constantly under perfect command.

"8. When any train has been detained so that another will be on the track, its conductor or engine man, unless he can by proceeding as before directed, meet such other train near to a switch, will back his train carefully to the switch last past, and wait there. When two trains meet on the track, the conductor of that which has kept its regular time shall direct which is to go back.

"9. If a passenger train does not arrive at Baltimore or York one hour after the regular time of arrival, or a burden train, 1 hour and 30 minutes after its regular time, an engine will be despatched to meet the train thus delayed. The trains so detained will accordingly proceed with great caution as before directed, expecting to meet the engine in every instance, unless written notice to the contrary has been given.

"10. The train first arriving at a station where it is to meet another, will water, and then take the proper position to allow the other to water and pass, the conductor taking care that the switches are properly fixed for the expected train. If both trains arrive near the switch about the same time, the train coming towards Baltimore will first water. A burden train however will in all

cases give way to a passenger train, and follow the directions of the conductor of the latter, on all occasions.

"11. All locomotives are to hold up on approaching every water station, so that they may readily stop, should a car or train be there. If a train is for any reason stopped at any other place on the road, its conductor will send a man 300 yards, or further if necessary, along the track in the direction in which the next train is to approach, so that it may be stopped before reaching his train.

"12. If any train is not to start at the regular time, or is to meet another train at a different place than the one prescribed, a written note must be sent from the depots at Baltimore and York, or from a conductor of a train. No conductor or engineman will pay regard to any message he may receive when on the road, respecting an alteration in the time or place of meeting, unless he receives a written note as above.

"13. All conductors and engine men in the employ of the company, will take the time from this office."

The purpose of the following tables is obvious. A book containing numbers of them, both for the going and returning trip, is given to each conductor, by whom an entry is made in each column at every place, and thus the whole time consumed on the road is accounted for.

TIME TABLES *for arrival at*

PASSENGER TRAINS.

| | Arrival. | | Arrival. | |
|---|---|---|---|---|
| | H. | M. | H. | M. |
| Balt. City Depot, | | M. | | M. |
| Bolton do. | | M. | | M. |
| Cockeysville, | | M. | | M. |
| Parkton, | | M. | | M. |
| Summit, | | M. | | M. |
| Heathcote's, | | M. | | M. |
| York, | | M. | | M. |
| Wrightsville, | | M. | | M. |
| York, | | M. | | M. |

**From Baltimore to York,** 184 .
*Locomotive,* . . .
*Engineman,* . . .

| | Arrival. H. | Arrival. M. | Departure. H. | Departure. M. | Stoppage. H. | Stoppage. M. | Passengers. Rec'd | Passengers. Dis. | Free. |
|---|---|---|---|---|---|---|---|---|---|
| City Depot, | | | | | | | | | |
| Bolton do. | | | | | | | | | |
| Relay House, | | | | | | | | | |
| Cockeysville, | | | | | | | | | |
| Moncton, | | | | | | | | | |
| Parkton, | | | | | | | | | |
| Summit, | | | | | | | | | |
| Heathcote's | | | | | | | | | |
| Clodfe's Tank, | | | | | | | | | |
| York, | | | | | | | | | |

STOPPAGES AT OTHER PLACES.

| | Stoppage. H. | Stoppage. M. | Passengers. Rec'd. | Passengers. Disch'd. |
|---|---|---|---|---|
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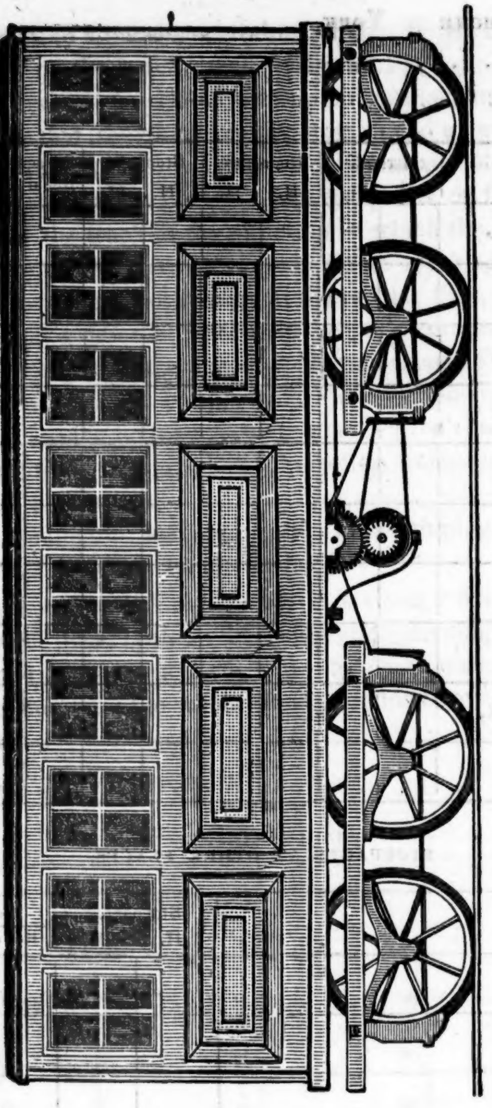
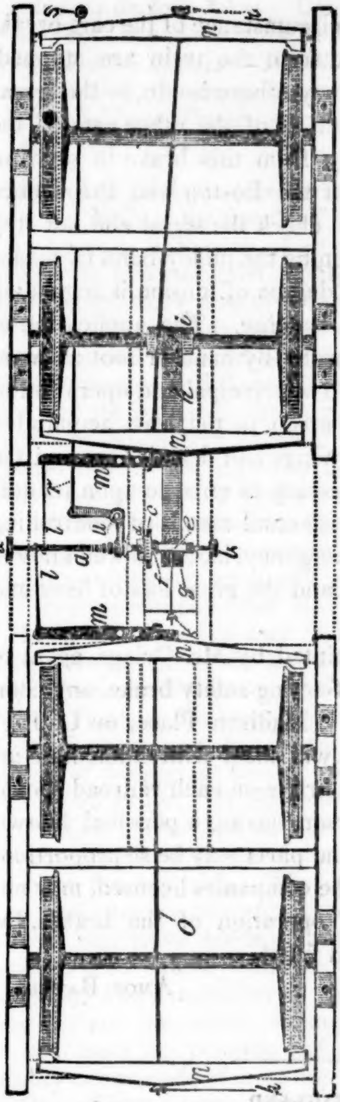
| | | | | |

. . . *Conductor.*



SELF-ACTING SAFETY BRAKE FOR RAILROAD CARS.

*Description.*—*a*, Represents a shaft suspended to a body of the car by boxes *b b*. *c*, A cog wheel, which revolves on shaft *a*, when not connected by clutch *d*. *e*, A frame suspended on shaft *a*, supporting pinion *f*, pulley *g*. *h*, A belt passing over pully *g*, and the axle of the car *i*. *k*, Tempering screw, connected with frame *e*, and body of the car, to keep the bolt sufficiently tight to allow the car wheels to just turn, or to make them slide when the brakes are ap-



plied. *l l*, Chains attached to shaft *a*, and levers *m m*, which wind round the shaft *a*, when wheel *e*, is connected by clutch on shaft *a*. *m m*, Levers connected to brakes *n n n n*, by rod *o o*, on one end of which are the tempering screws *p p*, to adjust the brakes to the wheels, so that they shall bring them all to slide at the same time. *u*, A forked lever, supported by the frame of the car to move the clutch *d*, by means of the rod *r*, which is connected with the upright lever *s*, the top of which is in form of a *T*, to which is affixed lines leading to the engine, by which the wheel *e* may be clutched to the shaft *a*, (the axle of the car acting on the pulley *g*, connected to pinion *f* by belt *h*,) and cause the chains *l l* to wind on shaft *a*, and thus draw on levers *m m*, connected with the brakes *n n n n*, and cause them to stop the revolution of all the wheels.

The 1st of the above drawings is an elevation of an eight wheel passenger car, with Grigg's band and pulley-brake attached. The 2d drawing is a horizontal section, showing the band and pulley-brake.

Two lines are attached to the *T*, that may be carried to any part of the train, so that the engineer, or any person on the train, may, by means of these lines, govern the brakes and stop the train.

The advantages of this brake are described in the specification by the patentee to be, that expense is saved in the smaller number of brakemen required. The train may be checked as soon as the engineer or any one forward, descries danger ; and the apparatus is more effectual and more certain for this purpose than the common hand-brake. The danger arising from the brakemen jumping off as they sometimes do, is avoided. In case of some of the cars breaking loose, as they sometimes do, the lines are so adjusted that

the brake is put in gear by the very circumstance of the cars breaking loose, and thus the cars detached from the train are stopped, instead of drifting on the road as they otherwise do, to the great danger of cars thus detached, as well as of the other cars of the train;—(an instance of the security from this brake in such an emergency has actually occurred on the Boston and Providence railroad.) If the object be merely to check the speed and not stop the train, this is done by merely loosening the pulley-band by means of the tempering screw, by which its degree of tension is regulated. The brake is of comparatively small expense. The application of it does not prevent managing the brake by hand or foot as heretofore, whenever this is preferred. The principal and operation of this brake will be obvious to any person, in the least acquainted with the subject, from the above drawings and description, and the patentee deems it to be quite unnecessary to enlarge upon its utility. The want of some ready and effectual means of controlling and stopping the train, in cases of emergency, has, as is well known, been the occasion of many disasters and the great loss of lives and property.

The subscriber having been appointed by Mr. Griggs, agent to make contracts for the use of his self-acting safety brake. any communication directed to him at No. 6 Madison Place, or G. J. F. Bryant, No. 4 Court street, Boston, will meet with immediate attention. It is desirable that the first brake on each railroad should be constructed and put on by a person having a personal knowledge of the brakes now in use, that the parts may be so proportioned and fitted, that the patentee and the companies licensed, may not be subject to disappointment in the operation of the brakes, by reason of their being constructed and fitted.

AMOS BATES.

BOSTON, *October* 23, 1841.

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## RAILWAYS IN ENGLAND.

*A practical Treatise on Railroads and Interior Communication in general.* By Nicholas Wood, C. E. 3rd. edit. Longman & Co.
*The Railways of Great Britain and Ireland: a Practical Treatise.* By Francis Wishaw, C. E. Simpkin & Co.
*A Practical Treatise on Railways, explaining their Construction and Management.* By Lieut. Lecount, R. N., of the London and Birmingham Railway. Edinburgh, Black.
*Bradshaw's Map of the Railways of Great Britain, showing their Lines, Lengths, and Gradients.—A Letter to the President of the Board of Trade on Railway Transit.* By F. R. Conder, C. E.—

*Reports on Iron Rails.* By Prof. Barlow.—*A Letter from Josiah to Prof. Barlow on Iron Rails.—Remarks on the Cheapest Distance of Railway Blocks.—The Railway Annual.—The Railway Almanac.—The Railway Pocket Book.—The Railway Magazine.—The Railway Times.*—Some dozen or more of '*Railway Guides*', etc., etc.

The Age of Iron (cast-iron or malleable?) has now at length brought with it the epoch of Vulcanian Letters. Our table trembles beneath a burden of this new and voluminous literature, of which the preceding list is only an imperfect and random selection. It is hardly to be conceived that there is a department of life or of literature not already permeated by the genius of iron, or a recluse so antiquated as not to experience a deep and soul stirring interest in the practice and theory, the statistics and the legislation, the police and the polemics, the topography, chronology, etc., of railway bars and locomotive engines. The supply of the article has done Adam Smith the justice to keep pace with the demand, and the short period of ten years has produced all the possible species of volumes calculated to meet the wants of consumers, from the substantial treatise in portly folio and folded plates down to the waistcoat bijou in satin and gold. We have railway annuals and railway perennials—the Railway 'Quarterly' and the Railway 'Magazine'—the Railway 'Chronicle' and the Railway 'Times'—the Railway 'Map,' the Railway 'Guide,'—the Railway Time, Fare, and Distance Table—and the Railway 'Hoyle,' in the shape of 'Plain Hints to Railway Speculators.' Those who relish the literature of strife, may find in the piquant polemics of railways many dishes of the highest flavor. We have, on one side, the advocates of the broad gauge. We have Stephenson backing his six-wheeled engine against time and all the world; and Bury, on the other side, betting on his four-wheelers against all the world and Stephenson to boot, for any odds. We have wood-sleepers versus stone-sleepers; continuous bearings versus detached blocks; cheap inclines versus expensive levels; inside bearings versus outside bearings; and, in fine, railways and locomotives versus all the world,—commanding and compelling all of us, old and young, male and female, learned and unlearned, willing or unwilling, to "stand and deliver" up our time, our persons, and our money, to the mercy of those ungainly compounds of most unpicturesque and ungracefully combined masses of iron—iron—iron. Not contented with the highway, they follow us to our closets, and persecute us even in our sanctum sanctorum of editorial seclusion, backed by their hosts of vociferating volumes and clamorous authors.

The three treatises at the head of this article communicate a thorough and practical digest of our knowledge of the present state and past workings of the railway system. The first may be called a Statistical, the Second a Theoretical and Mechanical, the third an Economic Treatise on Railways. Mr. Wood is a sagacious observer, and a sound and cautious reasoner; Mr. Wishsw is a discriminating statistician, and has a thorough acquaintance with his subject; Mr.

Lecount has had considerable experience in the practical working of railways, and gives his readers the full benefit of all his knowledge. The remaining works serve to illustrate the minute details of the subject.

It has, indeed, been matter of surprise and comment to some of our readers and correspondents, that we have not devoted more of our attention to the new science of railway locomotion. For our own part, we have not been inattentive to the steps by which this important art of mechanical transit has been advancing towards perfection. Neither have we undervalued the high importance of this new element of civilization, of national wealth, of national energy. But we have regarded the art as one which had not yet attained to any established system, in which could be recognised great general principles capable of scientific exposition; but rather as made up of a series of tentative experiments, a system of trial and error, of which the practical results were somewhat uncertain, and of which the short space of ten years, during which alone they have existed as channels of general intercourse, has been by no means sufficient to determine in all cases their respective value and importance.

The rapidity with which this great iron revolution is extended over space is wonderful and unparalleled, except by the strangeness and speed of transit which has itself been achieved by the iron road (*chemin de fer*) and the Vulcanian Pegasus,—that most wonderful and most perfect of all man's creations. Ten years ago a railway was all but unknown; a tram-road of iron, sufficient to guide a few coal wagons from the coal hill to the port of delivery, and to enable them to follow the track of an old horse at the rate of two or three miles an hour, was what the small number of us, who knew anything at all about a railway, understood to be meant by the phrase. It was the joint necessity and impossibility of an additional canal from Liverpool to Manchester which first compelled the merchants of that enterprising port to entertain the project of a railway on a great scale, and it is to their spirit and determination that we owe much of the advantage now obtained. In 1826, when they applied to Parliament, even their own engineers seemed to entertain very little idea of their present results. Mr. Stephenson, who has since become so eminent as a railway propagandist, held out the expectation, that on this railway locomotive engines carrying thirty of forty tons might possibly be able to travel at the rate of six miles an hour with safety and security. The author of the Railway Treatise at the head of our article, thought that the rate of twelve miles an hour would be a dangerous and useless speed. Mr. Rastrick reported, that by improvements on the engine, forty tons might be carried along a railway at the rate of six or even twelve miles an hour, but that the latter rate was decidedly unsafe! At this moment twenty-five miles is the regular slow speed, beyond which the conductors of engines are forbidden to travel, although the double of it is what has been often attained; while, instead of 30 or 40 tons, the weight of a train is 100 to 200 tons.

Ten years' experience now does all this safely and well, daily,

hourly, and every where. Twenty-five hundred miles of railways, almost all of them double lines of road, traverse our little island, connecting all the principal towns and provinces with the great centre of money and of mind. Now, indeed, we may boast of an "iron-bound" rock of ocean. A chain of iron links firmly to this great head, in close and intimate union, the great members of our body politic, commercial and literary. We all think, feel and act more closely in union Provincial disadvantages and distinctions rapidly wear away ; local antipathies become forgotten, and the great unit of British industry, commercial enterprise, wealth and wisdom, is becoming more firm, more energetic, more powerful, and more promising of prolonged health and permanent stability. Dissension, discord, division, dismemberment, must become less and less possible in direct proportion to the intimacy of connection and facility of communication among its component parts. More than fifty millions of capital are already devoted to the creation of new railways ; and in return for this investment, something like five millions will every year be created and returned into the treasury of our capitalists, for re-investment and the extension of *its* powers and *our* privileges. Not only do these railways facilitate trade and commerce, and give increased activity to mercantile interests in general, but if we consider the expenditure of a railway consists principally in the tear and wear of machinery the produce of human labor, the great part of which is dug from the bowels of the earth and formed by human skill, we shall see that many new and important departments of commerce and trade are created and fed by this new economic and social power. This new social element is extending the range of action so fast and so far, that there will soon cease to be any section of the community, or any individual in society, sufficiently severed from its immediate interests, to be altogether beyond the sphere of its influence. Noblemen, men of property, merchants, and traders, will almost all be soon embraced in the multitudinous constituency of railway directors or holders of railway stock. While the saving of the wear and tear of human life by the wholesale means of economical transport thus provided has in many districts rendered the most laborious and the poorest portion of the community not only the class on whom the greatest benefit has been conferred, but that also which has contributed most abundantly to the success of such undertakings, as thousands now travel by this most rapid conveyance who were not before able to avail themselves of any. *The subject is, therefore, one which must, sooner or later come closely home to the interests of every member of society.*

All the great modern railways are formed of the edge rail—the rail projecting upwards above the ground, presenting an edge not more than two or three inches broad, raised some inches above the ground, on the top of which roll the wheels of all the vehicles : these wheels having, so to speak, grooves, or rather projecting edges or flanges, which prevent them from running off the rail.

In comparing together different railways, and weighing the merits of different systems, we have only to recollect that the essential requisites of all railways are—*sustaining power* in the road itself,

and *self-directing power* in both the equipage it conveys and the road itself. The former the element of its economy and efficiency, the latter the condition of safety with speed.

It was long in being discovered that this rail, Stephensons famous fish-bellied rail, is essentially defective. Although it is constructed on an avowedly good principal, namely, that on which iron beams are formed to carry a weight from wall to wall, or from pillar to pillar, yet it is essentially defective in principle, for this reason, that the railway bar does not terminate at each space of three feet where it is supported: it is continuous through five such spaces, and passing over each pedestal or chair as well as up to it, is as liable to be broken across upon and over this support, by a weight resting on each side of it, as to be broken in the middle by what rests upon it; in fact the narrowest, as well as the deepest, part of the rail, becomes alternately the centre point of greatest strain. Experience proved the inability of this form of rail to sustain the enormous weights it had to carry. But although practical experience rendered it necessary to give up, to a great extent, the fish-bellied rail, that form has still its advocates, probably from the circumstance of overlooking the principal we have now adduced.

The parallel rail, consisting of a deep thin bar or web laid on edge, swelling out above into a broad flat band, about three inches in breadth, for the purpose of carrying the carriage-wheels, and bounded below by a similar, but often a smaller band, is a species of rail which is rapidly superseding the fish-bellied rail. It has the advantage of being as strong at the chair to sustain weight as a fulcrum and lever as it is in the middle, where its action is merely reversed. The comparative value of the parallel and of the fish-bellied rail has formed the subject of much controversial discussion among the different schools of engineers. The result appears to be the increasing use of the former, and the abandonment of the latter.

The following comparisons are from the experiments of Professor Barlow, and show us, that even as regards strength to oppose friction by a weight in the centre, the alleged peculiarity of the fish-bellied rail, a parallel rail may, if properly formed, bear an equal or greater weight, with less flexure:

| | | | | |
|---|---|---|---|---|
| Bellied rail, weighing | 50 lb. | carried | 8 tons, | and bent 0·066. |
| Parallel rail, " | 50 lb. | " | 8 tons, | " 0·048. |

These trials were made under the same circumstances, both rails weighing fifty pounds a yard, and supported at a distance of thirty-three inches. Mr. Barlow remarks,—

"It appears, from these results, that it is always possible to produce a parallel rail, of good practical proportions, which shall be as strong as a fish-bellied rail of the same weight; and this being the case, I am decidedly convinced, after hearing and weighing well every argument that has been advanced in favor of the latter form, that the parallel rail is the best."

**The following are some interesting results of experiments made by Professor Barlow on this subject.**

Deflections of the rail of the Dublin and Kingston Railway, by the passage of the Swiftsure engine along the rail—the rail weighing 45 lbs. a yard, with supports or bearings at 3 feet distance from each other, the bars being in lengths of 15 feet:—

| | |
|---|---|
| Near the joint the deflection was - - | 0·167 of an inch |
| Near the middle - - - - - - - | 0·112 |

Now, this deflection of from one-tenth to one-seventh of an inch in the middle of a rail, is equivalent to ascending a slope of one foot in 450, to one foot in 600, which adds from a third to a half to the resistance of the railway, or the force necessary to draw a load. Of course, this evil is one of the first magnitude, and it is now the duty of the proprietors and engineers of railways to use a rail of great strength, of a stiff form and of considerable weight.

An important fact, which is attended with practical evil, is evident in these experiments: the rail bends under the load near the joint more than anywhere else, in a proportion of nearly 4 to 3—hence, the rail should be strengthened at this point, an object easily attained by bringing the chairs nearer to one another, a precaution attended to in few of the railways we have examined.

Our readers will now be prepared for the great diversity of practice which exists in the different rails of the English railways. In perusing such a work as that of Mr. Wishaw, full of important and valuable statistics, we meet with astonishing diversity in weight of rail; but in general it is to be observed, that the more recent railways have the heavier rail, and that many have changed, although at great expense, from one to the other.

To assist our readers in this inquiry, we have compiled the following table, showing the weights of rails on different railways, and the dates at which they were in use:

| | | lb. | per yard. | lb. |
|---|---|---|---|---|
| Liverpool and Manchester - - | in | 1830, 35, | in | 1840, 60–75. |
| London and Birmingham - - - | | 1836, 50, | | 1840, 75 |
| Stockton and Darlington - - - | | 1832, 28, | | 1840, 64 |
| Great Western - - - - - - | | 1838, 44, | | 1840, 62 |
| Garnkirk and Glasgow - - - - | | 1830, 28, | | 1840, 50 |
| Ardrossan and Johnston - - - | | 1827, 28, | | 1840, 56 |
| Ballochney - - - - - - - - | | 1826, 20, | | 1840, 54 |
| Eastern Counties - - - - - - | | 1840, 75, | | |
| Edinburgh and Glasgow - - - | | 1840, 75, | | |

[*English paper.*

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[From the Civil Engineer and Architect's Journal.]

## ENGINEERING WORKS OF THE ANCIENTS.

*Persian engineering.—Canals—Tigris—inundation—irrigation.*—It is in those works which treat of Persia and Egypt that we find the most information as to engineering, for the Greeks, as we have before explained, from geographical position, having no considerable rivers, were not called upon to execute those long canals and

large bridges which were of vital necessity to their eastern and southern neighbors. It is therefore in Asia and Africa that we must look for the schools of engineering, of which the practice has been transmitted to us through the Greeks and Romans. When quoting from Herodotus we before mentioned the Persian canals, and we now take from Xenophon, commander of the Greek army, what he says on the subject in his work called the expedition of Cyrus, or retreat of the ten thousand; it being our purpose not to collect what has been said on each individual subject, but to abstract from each author seriatim his seperate testimony, so as to form in these essays a kind of diplomatic collection or chartulary, from which the student may derive his own materials. Of the plain of Babylon, our author says, that in it are four canals derived from the river Tigris; being each one hundred feet in breadth, and deep enough for barges ladened with corn to sail therein; they fall into the Euphrates, and are distant from one another one parasang, having bridges over them. With regard to the origin of these canals, Arrian differs from our author, as he says that the canals which ran from one to the other are derived from the Euphrates and fall into the Tigris. Strabo and Pliny confirm this, assigning as a reason for the construction of the canals, that they are cut to receive and distribute the increase of water arising from the melting of the spring snows.

Clearchus whilst in the same district on his retreat was much embarrassed by meeting with canals and ditches full of water. Clearchus suspected that as this was not the season to water the country, that the king had ordered the waters to be let out to impede the Greeks on their march.

About a day's march from Babylon the Greeks made in two days a march from Babylon, eight parasangs and passed two canals one upon a bridge, the other upon seven pontoons. Xenophon again says that these canals were derived from the Tigris, and that from them ditches were cut that ran into the country, the first broad, then narrower, which at last ended in small water courses, such as were used in Greece to water a kind of grain called panic.

To the history of these canals we shall be able to derive many contributions when we come to the works of Strabo, Pliny and Ammianus Marcellinus. The boats of the Babylonians, as described by Herodotus, were peculiarly adapted for the navigation of these canals. At present the canals are choked up.

*Bridges.—Passage of rivers and canals.—Physcus.*—In the course of the expedition and the retreat, the Greeks came to many broad rivers, which in general they passed by fording, or by crossing on rafts; near Babylon they were able to avail themselves of the bridges of which they mention several. On one occasion coming to the Tigris they found the river very deep, when a Rhodian proposed the following plan. "I shall want," said he, "two thousand leather bags—I see here great numbers of sheep, goats oxen, and asses; if these are flayed, and their skins blown, we may easily pass the river with them. I shall also want the girths belonging to the

sumpter horses; with these I will fasten the bags to one another, and hanging stones to them, let them down into the water instead of anchors, then tie up the bags at both ends, and when they are upon the water, lay fascines upon them, and cover them with earth. Every bag will bear up two men, and the fascines and earth will prevent them from slipping." The generals considered this proposition ingenious, but were afterwards enabled to get out of their difficulties another way.

In the first book bridges are mentioned over four canals near Babylon, each a hundred feet long; in the second book we have a reference to another; and in the same book we find it stated that over the river Physcus, one hundred feet broad, a bridge was placed communicating with a large and populous city called Opis. When Clearchus came among the flooded canals, he passed them by temporary bridges made of palm trees.

*Wall of Media.*—In the second book we have mention of the wall of Media, which was built with burned bricks laid in bitumen: beingt wenty feet in thickness, one hundred feet in height, and as it was said twenty parasangs in length, and not far from Babylon.

*Cities and forts.—Walls.—Larissa.—Mespila.*—Larissa or Resen is described in the third book as a large uninhabited city near the Tigris, anciently inhabited by the Medes, the walls of which were five-and-twenty feet in breadth, one hundred in height, and two parasangs in circuit; all built with brick, except the plinth, which was of stone, and twenty feet high. One day's march from thence the Greeks came to a large uninhabited castle near a town, called Mespila, formerly inhabited also by the Medes. The plinth of the wall was built of polished stone full of shells, being fifty feet in breadth, and as many in height. Upon this stood a brick wall fifty feet also in breadth, one hundred in height, and six parasangs in circuit.

*Pyramid of Larissa.*—Close to the city of Larissa, says Xenophon, stands a pyramid of stone, one hundred feet square, and two hundred high, which seems to have been hollow.

*Greeks.*—The observation of Xenophon as to Greek engineering we extract from his history of the affairs of Greece. In his expedition of Cyrus however he alludes to the mole of the harbor of Byzantium, and to his forcing the Ionian Greeks to repair the roads through their cities preparatory to the march of his army.

*Quarries of the Piræus.*—The quarries of the Piræus (book 1st,) were in Xenophon's time wrought by Syracusan prisoners, who were confined there, and who made their escape by digging themselves a passage through the rock.

*Capture of Mantinea.*—In the course of the Peloponnesian war (book 5th,) Mantinea was captured by the Spartans under Agesipolis. Besides the usual works of digging a trench, and constructing a wall, he dammed up the river, which was a large one, running through the city. The channel being thus dammed up, the water

swelled above the foundations of the houses and of the city walls. The lower brickwork (being probably of raw bricks) was soon rotted by the wet, and shrank under the upper buildings, by which means the city walls cracked, and afterwards were ready to tumble. For some time they underpropped them with timber, and made use of all their art to keep them from falling. The Mantinians ultimately consented to demolish their walls.

*Bridge of Sellasia.*—A bridge is mentioned in the sixth book, at Sellasia leading to Sparta, but no description is given of it.

*Docks of Gytheum.*—The docks of the Spartans (book 6th,) were at Gytheum.

*Public Inns at Athens.—Shops, etc.*—In his pamphlet on the revenue of Athens, Xenophon alludes to the public inns for the use of strangers, he also recommends the building of greater numbers of shops, warehouses and exchanges for common retailers, relying upon it as a good means of revenue.

*Reparing public buildings by contract.*—Xenophon also in this pamphlet slightly alludes to the custom which the Greeks had of letting out the building and repair of their temples to private undertakers, also mentioned by Athenæus and Herodotus, B. 5, C. 62.

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## THE INFLUENCE OF RAILROADS IN DEVELOPING THE RESOURCES OF THE STATE.

We have only begun to experience this influence in Georgia, and shall not fully realize its extent until the contemplated lines are completed, and a thorough communication is established between the sea-board and the cities of the interior. Arguments are hardly necessary to prove that the increased facilities of intercourse between the several markets of the country and the sea-ports of the same, are ever attended with the most gratifying results in every point in which it can be viewed; and yet there are two or three positions which we are anxious to set before the people, which we are sure will commend these "popular democratic establishments" (as the Chevalier de Gerstner, the celebrated Austrian engineer, calls railroads) to every reflecting and intelligent mind.

In the first place railroads bring the produce of the country and the markets of the country in close proximity. Land and crops are only valuable in proportion to the ease of access to the one, and the facility of finding a market for the other. The reduction of relative distances by railroad has been astonishing and bears directly on this question. The real distance between New-York and Philadelphia, for example, is just the same now as it was a hundred years ago,—but the relative distance is changed from seven days to seven hours. New-Orleans is just as many geographical miles from the head of boat navigation on the Ohio, as it was before the first steamboats plied upon the western waters,—but yet, for all purposes of social or commercial intercourse, the distance is reduced from two or three months, to eight or nine days, so much is space annihilated by steam.

Macon is the same number of miles from us it was before the charter was given to the railroad; and yet on the completion of that road, instead of being by the former course of transportation a week distant from Savannah, it will be but twelve hours. Such are the advantages in point of saving time and distance—such is the compacting influence of these iron links, which bind us with the interior.

The increased facilities for the transportation of merchandize with the interior, is another advantage resulting from railroads. Throughout the whole line tracked by the Central railroad, the planter was formerly compelled to wagon his produce to market. This employed a number of hands, teams, horses; involved road expenses, breakage, damage by weather, and a variety of contingencies, and after all, his crop came in slowly, and he had to send it when he *could* rather than when he *would.*

By the railroad, all these things are avoided. He can now send it to suit the market, besides saving greatly in the expenses of transportation hitherto required. His crop reaches the city in better condition, and the whole process gives him more satisfaction than by the old and dilatory method. He is in fact, instead of being removed many days journey from his factor, placed within a few hours of his counting room, and daily accessible to his counsels. But aside from theories, *experience*, true uncontroverted experience shows, that wherever new channels of communication are opened with different sections of the country, whenever opportunities and facilities, combining convenience, despatch, frugality and security, are offered to the public, they have been embraced with eagerness, and have produced changes in the condition of society, of the most marked and effective character.

The increase of the number of passengers over the old stage travelling, by the establishment of railways has been on several of the European roads as follows:—

| | | |
|---|---|---|
| Manchester and Liverpool - - - - - | 300 | per cent. |
| Stockton and Darlington - - - - - - | 380 | " " |
| Newcastle and Carlisle - - - - - - | 455 | " " |
| Arbroath and Forfar - - - - - - - | 900 | " " |
| Brussels and Antwerp - - - - - - | 3,000 | " " |

The number of passengers formerly carried by coaches over the line of travel now covered by the Darlington railway, was about four thousand a year, it is now near sixteen thousand.

The Bolton line of travel required twenty-eight coaches, carrying a weekly average of about 280 or 300 persons—the railway on the contrary, conveys a weekly average of 2,500.

The annual number of passengers over the Dundee and Newtyle line, by the old conveyances was 4,000; since the opening of the railway, 50,000 a year.

Prior to the establisment of the railroad between Newcastle and Carlisle, the public coaches carried at the rate of 343 per week; now about 1,600 a week travel by the cars.

Four hundred passengers a day was the usual amount of travel between Liverpool and Manchester, before their union by the railroad; since then, its increase has been to fifteen hundred and ninety-seven.

Between Brussels and Antwerp, the annual travel was 75,000—since the railroad opened, it has increased to the astonishing number of *one million and over*, of passengers. The increase of frieght traffic has even exceeded the increase of travel, and in some instances has created a merchandize, hitherto not supposed to exist, and has made that valuable, which previously, for want of easy access to a market, was comparatively of little account. The immense coal trade of Pennsylvania is an illustration of this; and those immense stores of mineral wealth, which, till within a few years, have been dormant in the bowels of the earth, are now being developed to the aggrandizement of the State, to the increase of her treasury, to the enriching of individual enterprise, and to the elevation in every sense, of that "Key-stone" Commonwealth.

We doubt whether a railroad can be found in the world which has not increased the value of the land, throughout the entire extent; in some instances, one, two and three hundred per cent. And numberless cases could be cited, in which the railroad has completely revolutionized the country, converted its waste places into smiling villages, and made the hitherto uncultivated districts, swell with the labors of industry, and the harvest of the husbandman.

[*Savannah Georgian.*

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[From the Civil Engineer and Architect's Journal.]

## PREVENTION OF EXPLOSION IN STEAM ENGINE BOILERS.

*The gold Isis medal was presented by the society of arts to Mr. Robert M'Ewen, Glasgow for his double mercurial safety-valve for steam engine boilers.*

There are two evils against which it is especially necessary to provide in the construction of an apparatus for preventing explosion in boilers, viz. the possibility of the steam passage being intentionally closed, for the purpose of obtaining extraordinary pressure: and the failure of the self-action of the apparatus through the accidental derangement of its parts.

Mr. M'Ewen's apparatus consists of a pair of open tubes, the ends of which are immersed in mercury contained in cups connected with the boiler by a pipe. At the junction of this pipe with its branches for the two cups, is a three-way cock, the ports of which are so proportioned to the openings of the branch pipes, that the steam can neither be opened on, nor cut off from, both cups at the same time. The mercury tubes are proportioned in length to the greatest pressure which the boiler will bear with safety; the mercury will therefore be blown out of the acting tube into the dome at the top, whenever the pressure exceeds this limit, and will fall down through the other tube into the empty cup, while the steam

blows out through a pipe at the top of the dome.* When the pressure is sufficiently reduced, the cock may be turned, and the cup which was first filled becomes the acting side of the apparatus.

On the 7th of April, a committee of the society inspected the action of Mr. M'Ewen's mercurial valve, the apparatus having been attached to the boiler at the works of Messrs. Fairbairn and Murray of Mill Wall. The steam was opened on the mercury at a pressure of five pounds to the square inch, and as soon as it attained the pressure corresponding to the length of the tubes, viz. seven pounds, the mercury was blown, without any loss, into the dome and fell into the empty cup, while the steam blew out through the pipe at the top of the dome, and was condensed in a vessel placed to receive it for the purpose of experiment. On examination of the water in this vessel, not a particle of mercury was found in it. This result sufficiently proved the efficiency of the pipe, which is produced to some distance downwards within the dome, for the purpose of preventing the mercury from splashing out with the rush of steam.

As the action of this apparatus depends simply on a *physical* principle, viz. the opposition of the elastic force of steam to the static pressure of mercury, without the intervention of a *mechanical* obstruction of any kind, it cannot fail of acting, so soon as the pressure of steam exceeds the limit corresponding to the length of the tubes. The novelty of the invention is in the employment of a mercurial tube as a safe vent for the steam, these tubes having hitherto been used only as indicators of steam pressure, being long enough to allow the steam to attain a dangerous pressure without relieving it or giving any other notice of the fact than what may be observed by the eye.

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[From the Civil Engineer and Architect's Journal.]

## OBITUARY NOTICE OF SEVERAL DISTINGUISHED ENGINEERS, FROM THE ANNUAL REPORT OF THE INSTITUTION OF CIVIL ENGINEERS.

Francis Bramah was the second son of the late Mr. Joseph Bramah whose numerous inventions, perfection of workmanship, and genius in the mechanical arts, have rendered his name so widely and justly celebrated. The opportunities afforded to the son were ardently embraced by a mind of no ordinary powers, deeply imbued with the love of knowledge. Although his attention was in early youth more particularly directed to branches of minute mechanical construction, his acquaintance with the principal departments of professional knowledge and general science was very extensive. His attachment to the arts and to science was deep and sincere, and among many proofs of this may be particularly mentioned the valuable and essential services which he rendered to your late honorary member, Thomas Tredgold, both in his professional pursuits

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* Mr. M'Ewen intends that an alarm-whistle be placed in this opening, and also that the apparatus serve as a gauge for indicating the variation of pressure, by means of graduated float-rods in the mercury tubes.

and in the prosecution and verification of his theories and calculations. Mr. Bramah being professionally engaged at Buckingham Palace, in connection with some other engineers, difference in opinion existed and discussion arose, as to the true principle upon which the strength of cast iron beams to resist stress and flexure ought to be estimated, and with the view of verifying the principles laid down by Tredgold, he instituted a very extended series of experiments, on the deflection and strength of cast iron beams. These he presented to the Institution, and they are published in the second volume of your Transactions.

Several important works were executed under his direction, among which the iron work of the Waterloo gallery at Windsor castle, the cranks, the lock-gates, and their requisite machinery, at the St. Katharine's docks, and the massive gates at Constitution hill and Buckingham palace, may be particularly mentioned. Mr. Bramah was an early and deeply-attached member of this Institution; his constant attendance at the meetings, the information which he communicated, and his unwearied zeal as a member of the council cannot be too highly estimated, and his loss will be deeply felt and regretted within these walls. The variety of his attainments, his refined taste in the arts, his amiable character and the warmth of his affections, had secured to him the respect and esteem of a most extensive circle of friends, by whom, as indeed by all in any way connected with him, his loss will be most deeply and sincerely felt.

John Oldham, the engineer of the banks of England and Ireland, was born in Dublin, where he served an apprenticeship to the business of an engraver, which he practised for some time, but subsequently quitted to become a miniature painter, wherein he acquired some reputation. He pursued this branch of the arts for many years, but having a strong bias towards mechanical pursuits, he devoted much of his leisure time to the acquisition of that knowledge which was to prove the foundation of his future celebrity. In the year 1812 he proposed to the bank of Ireland his system of mechanical numbering and dating the notes, and on this being accepted, he became the chief engraver and engineer to that establishment. The period of twenty-two years during which he held this appointment, was marked by continually progressive steps of artistical and mechanical ingenuity. The various arrangements which he projected and carried out, attracted great attention, and conferred considerable celebrity on the establishment with which he was connected.

The late governor of the bank of England, Mr. T. A. Curtis, had his attention directed to these important improvements, and under his influence the whole system of engraving and printing, as pursued in the bank of Ireland, was introduced into the national establishment of this country, under the superintendance of its author, who continued in the service of the bank until his death.

The ingenuity of Mr Oldham was directed to other objects, especially to a system of ventilation, of which an account was given by the author during the session of 1837. Great versatility of inventive faculty, persevering industry, and social qualities of the highest order, were the prominent features in his character, and the

success which attended his exertions is one of the many gratifying instances to be found in the history of this country, of talents and industry, destitute of patronage attaining to eminence in the professions to which they are devoted.

Henry Rowles, the chairman of the Rymney iron works, was educated in the office of his relative, Mr. H. Holland, the architect, on quitting which he entered into business as a builder. He was engaged, among other extensive undertakings, in building several of the East India company's warehouses, the Royal mint, the Excise office, and Drury Lane theatre. He was an active director in several docks, railway, and other companies, and finally became managing director of the Rymney iron works, in the active discharge of the duties of which office he continued until his death. The Institution owes to him the drawings of the iron works made by Mr. Richards.

John Rickman was educated at Lincoln college, Oxford, and graduated there; he subsequently devoted himself to literary pursuits, to political economy and to practical mechanics. For some years he was conductor and principal contributor to the "Agricultural and Commercial Magazine." In 1801 he removed to Dublin, as private secretary to the Right Hon. Charles Abbot, then keeper of his Majesty's privy seal in Ireland. Upon the election of Mr. Abbot to the speaker's chair in the House of Commons, Mr. Rickman continued to be his private secretary, and in 1814 he was appointed to the table of the House of Commons. He also acted as secretary to the two commissioners appointed by act of parliament in 1803, "for the making of roads and bridges in Scotland, and for the construction of the Caledonian canal," and to the commissioners "for building churches in the Highlands." The ability and energy which he displayed in the discharge and conduct of the duties of these laborious offices, for more than thirty years, in addition to his constant attendance at the House of Commons, called forth the warmest acknowledgments of public meetings held in the Scotch counties on his retirement, and various resolutions were passed expressive of the sense entertained of the unremitting exertions, and uniform and disinterested assiduity, with which he had promoted every object connected with the improvement and general prosperity of the Highlands and Isles of Scotland. The conduct of the affairs of the Highland commissioners brought Mr. Rickman into constant intercourse with their engineer, Mr. Telford; an intimate friendship was formed between them, and Mr. Rickman completed and published an account of the life and works of that eminent man, which was but partially arranged at the time of his decease.

Mr. Rickman's chief work is the census of Great Britain, in six folio volumes; he is also the author of numerous papers connected with statistics, having bestowed great pains in collecting and arranging the returns connected with education and local taxation. To this Institution he rendered very essential services, and whenever application was made to him in its behalf, was always zealous in endeavoring to promote its interests. The library was enriched by him with two copies of the life and works of Telford, and as

the acting executor of Telford, he endeavored to carry out, by every means in his power, the intentions of that great benefactor of the Institution.

Mr. Rickman's acquirements in every department of knowledge were accurate and extensive; to great quickness of perception, and memory of no ordinary power, were added indefatigable industry, undeviating method, and a sound critical judgment;—qualities which caused his acquaintance to be highly valued by the most distinguished literary characters of the day, and which no less than the strict and scrupulous sense of justice and honor, which particularly showed itself in his considerate kindness towards all those with whom he was connected, will occasion his loss to be deeply regretted by a widely extended circle.

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### CHANGES WROUGHT BY STEAM.

Those who are able to look back fifty or even twenty years, cannot but be struck with the remarkably increased facilities of intercourse and travelling in the United States. Steam has produced a change, which the good old people of Salem would reverently attribute more to witchcraft than to the well directed agency of natural causes. It is but *eighty years* since the first stage coach was established in America. It ran between Portsmouth, N. H. 5th 8 and Charlestown, Mass.; was a mere two horse carriage, and would only accommodate three persons; it left Portsmouth on Monday and arrived in Boston on Wednesday evening. This was accounted quite good travelling. Now, you can go from Boston to Portsmouth, *and back again*, between sunrise and sunset. "Such was the difficulty," said one, at the centennial celebration of the settlement of Springfield, Mass., "of crossing the pathless wilderness which lay between them (the first settlers) and the coast, that a man may now go from Boston to New Orleans by way of Pittsburg, a distance of 2,500 miles, in about as many days as it took the first colonists to reach the Connecticut river." What would one of the Puritan Fathers have thought, could the spirit of improvement, assuming a mortal shape, have appeared and foretold, that in a few ages, that journey, which now costs weeks of anxious toil, would be performed in five hours of easy locomotion? It would have been to him as one that mocked. The first four horse stage coach in America, was started in 1774, and run between Boston, Salem, and Newburyport. The sound of a locomotive puffing and sputtering through the streets of Salem, would be a far more terrible sound to old Cotton Mather, than all the incantations of the condemned witches. He would indeed think as he saw it whirling, self moved, twenty miles an hour, sending forth its smoke and fire and vapor, that it was truly the embodied evil one, "going about like a roaring lion."

In the debates concerning the propriety of forming *a plan of union*, which was discussed at Albany in 1754, in a convention of delegates from the several American colonies met for that purpose, Dr. Franklin in urging that Philadelphia should be the seat of Gov-

ernment, gave as his most cogent reasons the following, which illustrate the condition of travelling in that day: "Phildelphia," said he, "was named as being nearer the centre of the colonies, where the commissioners would be well and cheaply accommodated. The high roads, through the whole extent, are, for the most part, very good, on which forty or fifty miles a day may very well be, and frequently are travelled. Great part of the way may likewise be gone by water. In summer time, the passages are frequently performed in a week from Charleston to Philadelphia and New York; and from Rhode Island to New York, through the sound, in two or three days; and from New York to Philadelphia, by water and land, in two days, by stage, boats and wheel carriages, that set out every other day. The journey from Charleston to Philadelphia may likewise be facilitated by boats running up Chesapeake bay three hundred miles. But if the whole journey be performed on horseback, the most distant members, viz: the two from New Hampshire and from South Carolina, may probably render themselves at Philadelphia in fifteen or twenty days; the majority may be there in much less time."

Now, the delegate from the most southern point, then represented, (Charleston, S. C.) could reach Philadelphia in about fifty hours, and the members from New Hampshire might "render themselves" in that city, in as many hours as it then took days.

It is only forty-five years since the first turnpike coporation was chartered. Who does not remember the astonishing improvement in travelling which even turnpikes introduced? It is not forty years yet, since the first canal was completed; now, more than 2000 miles have been cut in nearly every State, and have added millions of dollars to the wealth of the country. It is but fourteen years since the first railroad was finished in America; it was three miles long, and was esteemed quite a curiosity. In fact, it is but *eleven* years since they have been used to convey passengers and run with speed; now, 5000 miles of railroad are completed, employing five hundred locomotives, and a capital of nearly one hundred millions of dollars.

It is but thirty-four years, since the steamboat "North River" made her passage between New York and Albany in *thirty-three* hours. Now, about a thousand ply in American waters; and the "Swallow" or the "North America" will take you from Albany to New York in *nine* short hours. Verily, this is a locomotive age; and steam—steam is working its miracles in our midst. The mere introduction, as an agent of power, of the vapor which fumes up from the spout of the tea kettle, has produced an entire revolution in the affairs of men. The changes, however, which have taken place in the west, are even more astonishing, than those which have transpired in the Atlantic States. The following account of "things seen by a young son of the west," originally published in the Cincinnati Register, is extracted from the People's Magazine, for July 13th, 1833. "I have seen the time when the only boat that floated on the surface of the Ohio, was a canoe, propelled by poles, used by two persons, one in the bow and the other in the stern.

"I have seen the day, when the introduction of the *keel boat*, with a shingle roof, was hailed as a mighty improvement in the business of the west. I remember the day, when a Canadian barge (as the St. Louis boats were called at the head of the Ohio,) was an important event in the transactions of the year. I remember the day when a passage of *four months* from Natchez to Pittsburg, was called *a speedy trip* for the best craft on the river; and when the boatmen, a race now extinct, leaped on shore after the voyage, and exhibited an air of as much triumph as did the sailors of Columbus on their return from the New World. I remember the time, when the canoe of a white man *dared not be launched on the bosom of the Alleghany.* I remember the time, when a trader to New Orleans, was viewed as the most enterprising among even the most hardy sons of the west; on his return from his six months trip, he was hailed as a traveller who had seen the world. I remember the day when the borders of the Ohio were a wilderness, and New Orleans was '*toto orbe divisa*' literally cut off from the world. I have lived to see two splendid cities, one devoted to manufactures, the other to commerce, spring up, where, in my boyhood, nothing appeared like civilization, but the hut of the soldier or the settler.

"I have lived to see the day when a visit to New Orleans from Cincinnati, requires no more preparation than a visit to a neighboring country town; I remember when it required as much previous arrangement as a voyage to Calcutta. I have lived to see vessels of 300 tons arriving in 12 or 15 days, from New Orleans at Cincinnati; and I calculate upon seeing them arrive in 10 days. I have lived to see vessels composing an amount of tonnage of upwards of 4,000 tons arrive in one week at the harbor of Cincinnati. All these things I have seen, and yet I feel myself entitled to be called a young son of the west." With regard to the calculations of the "young son of the west," as to the arrival of vessels in 10 days from New Orleans, we can say that they have been more than realised. Steamboats have run between the cities of Cincinnati and New Orleans in seven days.

The transforming power of steam seems like the work of a master Magician.—*Georgian.*

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[From the Civil Engineer and Architect's Journal.]

## IMPROVEMENTS IN RAILWAYS AND THE WHEELS OF LOCOMOTIVE ENGINES AND CARRIAGES.

In the first place, the leading and trailing wheels of locomotive engines either with four or six wheels, would work better were each wheel to be keyed upon a separate shaft, so as to revolve independently. This may easily be done in the following manner: let the wheels be keyed upon their respective shafts in the usual way, with either outside or inside bearings, which ever may be the most convenient and, let the shafts have middle bearings to meet in the regulating line common to all. If the wheels and axles are made in this way, the wheels on the outside rail would revolve quicker than those on the inside, and would allow the engine to find its own bearings. This would be particularly evident in going

round curves, and would be the means of preventing many accidents from engines being very liable to be thrown off the rails on those parts according to the present system. In the second place, it is proposed that each of the leading and trailing wheels shall be keyed upon a hollow shaft in the usual way; these shafts to have no external bearings, but to be bushed with brass, bored to fit the solid shaft, or spindles which will be required to work into them. The solid shafts to have a bearing at each end, and one in the middle if required. This plan will allow the outside and inside wheels to revolve independently on the curves or otherwise, and will also prevent them wearing irregularly. Should any obstacle be thrown in the way of the engine, the wheels revolving separately would prevent it from coming off the rails, as the wheels would act as a check to each other, or as a complete check or guard rail on any part of the line as hereafter explained.

Thirdly. The wheels to be made of either wrought or cast iron (the latter would be preferable,) and to have a flange on each side, by which plan they would not be required so strong as those now in use, because they would take the lateral concussions or side jolts more equally than the present kind.

Should the engine be thrown to one side, both wheels would take an equal share of the strain or jolt,whereas in the present system the wheels on one side take the whole strain. This properly adjusted, the conical wheels may be dispensed with, as well as the check or guide rails upon the whole line, which latter checks are a great nuisance. In the plan thus proposed the rails would be laid level or horizontally across and not at an angle as at present, and the wheels would have to be the segment of a circle upon the face, in place of being conical. Each wheel would thus act as a check rail for the other during the whole of the journey. Should the rails be out of gauge so as to cause the wheels on one side of the engine to mount upon their flanges, and throw the train off the rails, as is very often the case with the present system, the double flanges would obviate this evil and keep the engine in its proper course, until the wheels again found their places. The switches will remain without alteration, but the points may be altogether dispensed with. By this method of working, there will be a great saving in the wear and tear of the engines and rails, it will reduce the cost of keeping the engines and road in repair, and lessen the friction, as well as the quantity of fuel with all other expenses in like proportion. In constructing the permanent way, much time might be saved, as no attention will be required in laying the rails to an angle, as they would then be horizontal where the road itself is straight. Giving to the outside rails the proper rise in the curves, the angle of the two rails will incline both one way, and not reverse to each other as at present. This will afford the engine another mechanical advantage on the curves, giving gravity a much greater opportunity of acting against the momentum of the machine. The engine will also be kept in its proper course in the curves much more forcibly than is afforded by the present method of laying railroads by the present system, as the angles of the two rails are acting against each other, the

outsides of both being higher than the insides, and causing a great friction upon the axles, brasses, wheels and rails; this the proposed alteration will entirely obviate. All the conical wheels now in use, through concussions and constant rolling upon the rails, squeeze out on one side. No conical wheels retain their proper form much longer than two months if daily at work; each wheel causes the flange of the opposite wheel to act with great force on the inside of the rail, and *vice versa.* The large hollow fillet that is left in the angle of the flanges of the wheels crushes down the inside angle or corner of the rails; which the proposed wheels would obviate—the weight of the vehicle would be also much better distributed over the surface of the rails. This alone is a great inducement to the introduction of double flanged wheels on loose axles, as the rails would last double the length of time.

In the fourth place, the double flanges would prevent the wleels squeezing out, as they seldom squeeze out on the side next the flange, and being all made from cast iron, there would be no spreading. The longitudinal shake or clearance that is generally given to the axles in their brasses will not be required, as the action of each being entirely in itself, and inclosed in brass, will retain the oil much longer and not require that attention which the present do. Were the engines and carriages made according to this arrangement the loss of power in the curves would not exceed from 8 to 10 per cent. above that used on a straight line, always of course depending on the radius of the curves.

In the fifth place, the whole of the engine and tender wheels should be furnished with double flanges, the latter to be of different diameters causing thus different depths from the face of the wheel to the tops of those flanges. The reason of this will be easily explained.

Railways at present are nothing but a series of complication of curves, all differing in intensity. To carry engines round those continually changing curves without trailing and great friction, would require wheels of greater and less diameters, and this difficulty I propose to surmount by means of those flanges, which will become *bona fide* for the time, the wheels of the machine.

To enable me to make use of the above arangements, I propose to have radiated plates or segments put down on each side of the main rail, at such a depth from the face of the rail, as to cause the wheels to be lifted from the rail and allow the flanges to act on those segments; the machine rolling at one time on the large flange, at another time on the small, and from thence on the face of the wheel, those alternations of course depending on the nature and radius of the curve. The length and position of those segments would be found by a calculation depending on the intensity of the curves.

Were engines, carriages, etc., provided with such wheels, and the railways with segments to suit, it would be next to impossible for the train to leave the line of road; for, even supposing the whole of the tires on one side were to come off, the train would be kept in its course by the double flanges of the wheels on the opposite side. At present if a single tire comes off, the engine is precipitated from the rails, and if without any more serious result, the train is

detained till the arrival of another engine, train, or other means of locomotion. I may in addition mention that the fatal accidents arising from furious driving which is more or less practised on all lines, and is a terror to all travellers who have not the iron nerves of his Grace the Duke, would be altogether prevented; for not even the velocity of 100 miles per hour could force the engine or carriages off the line, so firmly would the wheels be bound to the rails, and so sweetly would they glide round the curves if made on the above construction.

With many apologies for intruding my ideas on your acquaintance,

I am your obedient servant,

WILLIAM ANDREWS.

*Paddington, March* 26, 1841.

P. S. Were the wheels and segments calculated for each other, the parting or cutting of the shafts could be dispensed with, and they might remain just as they are at present.

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## THE OPENING OF THE NEW-YORK AND ERIE RAILROAD.

We give the introductory remark of the *Georgian* to a notice of the opening of the New York and Erie railroad. They show how truly national the feeling in all parts of the country is, in regard to this important work.

"It sends the blood through our veins in quicker pulsations, to read of the commencement, or completion, of this or that effort, of American enterprise. *Onward!*—ONWARD! seems to be the universal watchword of our country. It resounds through the hills of New England, and meets the steam ship as it comes up from the waters; it is wafted by the winds from the nothern lakes across the rich farming districts of the middle States; the gathering streams of the great central valley bear it on its bosom; its echoes are rolled back from the base of the Rocky mountains: and the south, in all the pride of her staple products, and immense resources lifts up her voice, with the voice of the Union, to iterate and reiterate that glorious, soul-stirring word—ONWARD.

"The astonishing increase in the great schemes of improvement throughout the land, is almost incalculable. Never before has the public opinion been so thoroughly roused: never before have such noble enterprises been started: and all that is necessary to success, is to repress the wild extravagance of speculation, and confine these various operations, within the limits of prudence and judgment. The New York and Erie railroad promises to be one of the most important links between the seaboard and the west, and is a project of immense magnitude. Passing onwards from Goshen to Deposit on the Delaware river, thence across the valley of the Susquehanna, its western terminus is Dunkirk on Lake Erie, 52 miles west of Buffalo. The advantages proposed by the road, are not confined to securing a portion of the northwestern trade, but it will

open a highway through regions comparatively unsettled, will develope resources hitherto unknown, and plant the workshop—the school house—the factory—and the village, like flowers of industry along its borders."

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### POST OFFICE DEPARTMENT AND RAILROADS.

Mr. Editor.—I would respectfully call the attention of the Post Master General to the consideration of the policy of arranging some system, by which it can be made to appear that by applying a portion of the earnings of the Department in aiding the construction of railroads on mail routes, those very railroads can be rendered *increasing contributors* to the emoluments of the Post Office Department. I believe that some arrangement or system can be planned, that will accomplish this desirable end. I would not presume to project a plan—but I would simply throw out some hints which may lead to useful investigation. I would suggest—

1st. That the department should turn its eye to railroads forming *main trunks*, or important channels, possessing also, distribution depots.

Government should not wait till these roads are finished by private enterprise, which, after struggling through pecuniary difficulties, accomplish their object at great sacrifices—but liberally step forward and lend its aid under certain conditions—that is, contract for the conveyance of the mail bags by an outright subscription to so much of the capital stock.

Let us suppose, for example, that a farmer, a merchant or manufacturer, may have occasion for the daily use of a railroad, and an opportunity is offered to him, that by subscribing so much to the stock of said railroad, and taking his *pro rata* share of its dividends he shall also have the right of free passage of his produce, merchandize or wares, would he hesitate to become a subscriber on those terms?—Why then should not the Post Office Department see its interest in the free transit of its mail bags by a similar course?

2d. *The War Department.* Here the Government is equally interested. The free transit of men and munitions of war over railroads, offers another inducement to Government to secure, by early action in aid of railroads, an almost incalculable advantage. If Government has constitutional scruples on the sepoints—if it sees that it cannot aid private enterprise in creating these facile and rapid modes of transit—it is to be hoped that it will not complain that private enterprise should demand of Government, as of individuals, a compensating charge for the use of its railroads.

The British Government aids private enterprise in the construction of packet steamers, but contracts with said steam packet owners to carry the mail bags *free*; the postage pays back the loan with ample interest; and the Government stands in improved condition, having a *steam navy* also at command, and officers and men drilled to a new and formidable service, without expense to Government; for every steam packet thus built is fitted at a few days notice to become a vessel of war: to-day a messenger of peace and price currents—to-morrow a vessel of bombs and bullets.

Precisely so could it be with our railroads; equally useful and remunerating in all the arts of peace; as formidable and advantageous in carrying within brief periods all the means of defence and attack in war. Can any one doubt that it is as well *the duty* as *the interest* of the Government to look to this matter, and take an energetic stand to aid private enterprise in carrying this country to the utmost limits of *viability*. PETER SCRIBER.

[*New York American.*

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### THE USE OF CAST IRON.

The multiplicity of inventions, and the rapidity with which they are improved upon, are two distinguishing features of this active age. They seem to roll over society, like wave succeeding wave; one has hardly reached the strand of demonstrated utility, before it is succeeded by another, more progressive, to be followed up by the still advancing series of improvements and discoveries. The many uses to which cast and other forms of iron, have lately been put, is an evidence of our assertion, and shows how even that, which seems not merely strange hypothesis, but positive absurdity is made to illustrate the views of practical experience. Who, had he been told fifty years ago, that ships, would be made of iron, would not have regarded the asserter as a mad man? It was a Prophet's miricle to cause iron to swim, and yet without either Prophet or miricle, by the simple application of the laws of science, ships of iron are made, to go down to the sea, to do business upon the mighty waters. It is only about eleven years, since iron was used for the construction of vessels.

The "Ironsides" was the name of the first built in England; but now many have been made, and their virtues have been tested on the Ganges, the Niger, the coast of England and France, across the Atlantic, and even on our western waters.

Almost as wild in theory as the preceeding, is the application of cast iron to buildings. It is not long since, that we read of a church called the St. George, we believe, which had been erected in Liverpool, entirely of cast iron, which exhibited great beauty of design, and skill of execution.

A still more singular use of this material, is by the King of Russia, who has had constructed for him, at Berling, an immense cast iron marque, or tent, which cost nearly 40,000 francs, to be set up in the camp at Silicia, on the occasion of an approaching grand review, for the purpose of entertaining his officers and friends. This must be a curious specimen of workmanship in iron, and the design is as curious as the execution.

Last of all comes a newspaper paragraph, announcing that there is now building in London, a cast iron light house, intended to be placed on a dangerous reef of rocks at Morant Point, in the Island of Jamaica, the height of which is to be one hundred feet, and the diameter at the base, 18¾. Where will the wonders of this wonder working age extend? We have but just left the starting post of invention. The race is all before us,—the goal is many centures ahead.—*Savannah Georgian.*

Erie Railroad.—It is gratifying to the friends of this road to observe the increase of travel and freighting upon it. We are informed that the income of the road one day last week, amounted to nearly five hundred dollars. The expense of running is estimated at $175 per day. On Tuesday last Messrs. Dill, Jennings & Co., one of the freighting establishments, sent off in the afternoon train, 323 dressed hogs, weighing 29,975 lbs., 265 tubs and firkins of butter, weighing 20,850 lbs. and ten tons of other frieght. Messrs. Cash & Co., have also had some fine freights, perhaps equally as large, but we have not ascertained the amount. Large quantities of freight are also sent from the Chester depot. A company has been formed there for the purpose of transacting a freighting business.—*Goshen Democrat.*

Wood Paving.—On Saturday, at the meeting of the Marylebone vestry, one of the proprietors of Rankin's patent wood paving, proposed to lay down 600 yards, as an experiment, in Oxford street, between South Molton and Duke streets. The gentleman produced a model to the board, and said that the only possible objection to wood—its slipperiness was obviated by their blocks, which presented a good foot holding in every direction, and the proprietors were willing to lay down a specimen on a hill where there was the most severe and continued traffic, in blocks of Norway fir or English elm, at 16s. a square yard, the same to be kept in repair for seven years at 6d. per square yard. He remarked that though the surface blocks might be worn at the expiration of that time, the base blocks would be found as good as ever; and that if, at the end of six months, the specimen was not approved, the proprietors would remove it at their own expense. After it had been moved and seconded that the proposition be complied with, Mr. Cochran took occasion to observe that, on the previous day, Mr. Stephenson, the engineer, had told him that it was a mistaken notion that wood paving became rotten and quickly worn out, as was proved by the sleepers on the Leicester and Swanston railway, which though they had been laid down nine years, were now as good as at first. The motion was carried unanimously.—*London Standard, Oct.* 4.

London and Brighton Railway.—This stupendous undertaking is at length achieved, and the whole line was opened throughout, to the public yesterday morning. The difficulties with which the company have had to contend have been great, but they have all been surmounted with comparative ease, and the great work—a work characterised by an eminent engineer as almost impracticable—does honor to the engineers and the company. Its cutting, its embankments, and its tunnels, are immense, exceeding, perhaps, any other line in the kingdom in point of magnitude in the same distance. The most magnificient and imposing object on the line is the Ouse viaduct, about 34 miles from London, which is 1434 feet long, entirely built of brick, and consisting of 37 semi-circular arches, and 30 feet span. From the surface of a small river the parapet rises about 105 feet, and the structure, when seen from the bed of the valley, has an elegant appearance.—*Railway Times.*